

# The Invisible Weapon.....



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World War No. 2 and the year 1940 have wrought fundamental and unforeseen changes in warfare. Neutral, non-belligerent, and warring powers have found themselves faced with a hundred new problems—air power, motorized and mechanized units, new tactics, parachutists, and by no means least, the Fifth Column. In all this change, communication remains vital to the participant in war. And propaganda and the protection of military secrets are vital both to participants and to nations near the brink of involvement. Thus a mighty power in the struggle for world dominion by nations, forms of government, and ideals, is radio.

International radio is just now beginning to be evaluated adequately as the powerful though invisible weapon it is. Just as dominance in the air by plane may be the key to victory on land and sea, so the use of the ether waves may be the most potent means for mastery of the minds and hearts of men, without which no nation or ideal can survive.

Let us imagine, if we can, the invisible and increasing world-wide host of lightning messengers impressed on carrier waves. A magic which in effect has banished time and space throughout the entire globe. In a minute fraction of a second a mere whisper is audible from the Antipodes to the Arctic and from Cathay to the Caribbean, to one hundred million radio receivers, each capable of listening in to hundreds of messages. There is one radio

receiver for every twenty inhabitants, almost sixty million, in the Western Hemisphere alone. The air around our world seethes with long and short waves radiating to those hundred million receivers from more than fifty thousand transmitters of commercial, government, military and naval stations, and from those of over one hundred thousand efficient and indefatigable amateurs. From any point in the world, hundreds of powerful short-wave transmitters are easily contacted, relaying messages from the most remote points of all continents and from seventy-eight different countries. Such, briefly, is the most potentially powerful agency for many purposes that the world has ever known.

While the present airplane, tank, and automatic weapon have changed conditions of combat, radio broadcasting has completely revolutionized the problems of the intelligence sections of the services. For example, before and during the present war, Englishmen and Frenchmen have cleverly sold, in impeccable English and French, Nazi and Fascist ideals and beliefs over the air. Every day, the strongest effort has been made to discourage the English and French civilian public on war. In France, radio propaganda was used to create suspicion and break down confidence in the English alliance. Moreover, before the war and since, a steady stream of information has been sent secretly, quickly, and effectively by the German espionage system by way of the radio. The perfect coordina-

tion of troops with aviation, fifth columnists, and parachutists, particularly in Poland, Norway, and Holland, was accomplished largely through radio broadcasting. Also, the German submarine that threaded its way through the safeguards, mines, patrols, nets, and booms of Scapa Flow on October 14, 1939, and sank the British battleship *Royal Oak*, was undoubtedly guided by some seemingly innocent radio broadcast in England or Holland, perhaps even a band concert or a dramatic presentation.

Just as the ancient counterpart of the tank, the elephant, was employed by the Persians centuries ago, codes and ciphers have been used as long as there has been war. In fact, recorded history tells us that a cryptogram to Ly-sander of Sparta saved a general, an army, and the empire later to be enlarged by Alexander the Great. At the same time, all authorities from Julius Caesar, one of the first cryptographers, to the Black Chamber of the last World War, all agree that there is really no secret writing code or cipher created by man that cannot be broken by man. But as Francis Bacon, Lord Verulam, himself one of the world's greatest cryptologists, said in his *Advancement of Learning*: "The only truly secret system of writing conceals the existence of a secret." Little did Bacon know of the day when the secret would be even better concealed by not even being written. Seconds may now send a crucial cryptogram hurtling thousands of miles through space, whose secret meaning and presence is known only to sender and receiver. And an instant after it is delivered there is not one shred of evidence, nor even a record of any kind by which the message can be deciphered into the "clear." Such is the blitzkrieg in the cryptographic battle of radio in World War No. 2.

A practical illustration will be far more effective, perhaps, than dissertations in history and literature. Not long ago, a former world's heavyweight boxing champion, in an interview on a major network of thirty-nine United States stations, capable of being picked up over thousands of miles, broadcast a message in the most simple jargon code, so simple that any amateur cryptographer or alert listener should have made it out. The broadcast had a potential audience of twenty-eight million radio homes in the United States alone. Evidently not a single listener caught the message because not a single listener was expecting it. The message was: "S 112—SS. *Queen Elizabeth* sails tonight with hundreds of airplanes for Halifax, N.B." Neither the sponsor, the network, the world's champion, or the sports commentator interviewing the champion knew anything about the message. This particular message, of course, was only sent out as an experiment to see whether anyone would pick it up from the air waves. But if such a message can be sent, with millions listening in, is it safe to assume that there have not been far more important uses made of this agency here in America.

If radio could be used with such devastating effect in Europe, it can be used here with even more telling effect. In America, because of our commercial radio system, our

programs are the best in the world. Single radio performances of many of our network programs would be events of outstanding importance in other countries. As a result, we have by far the greatest radio-listening audience in the world, and in no country can more people be reached by radio than here. Also, in no country is there any greater freedom and tolerance. All these facts, it seems most evident, constitute a new and serious military problem.

There are some 813 commercial (long-wave) broadcasting stations in the United States, over six hundred more than in all Europe combined, and in addition, all of ours are privately owned. Then there are thirteen short-wave stations, twenty-one television stations, and sixteen facsimile stations. There are over fifty-three million radio receiving sets, including eight million automobile sets, in the United States, and a potential audience of over one hundred million. The problem of planning the control of radio by the War Department to cover both prewar and wartime necessities is staggering. All stations should be carefully guarded or controlled:

(1) Against cryptic broadcasting, which either relays military information by enemy espionage agents, or coordinates fifth column activities, this in addition to providing ordinary censorship of news that might be of value to the enemy.

(2) For the broadcasting of propaganda and information to combat the enemy's short-wave propaganda which would be intensified in case of war (there are many foreign short-wave broadcasting stations easily picked up here); also propaganda to serve as a deterrent against fifth-column activity.

(3) For the proper kind of recreation and morale-building entertainment, which would require minimum attention from the War Department, since this is a radio station's ordinary service in peacetime.

(4) In order to minimize or neutralize the effects of possible physical seizure by enemy armed forces or the fifth column.

According to report from excellent authority, though so far unconfirmed, the break-through at Sedan on May 14, 1940, which caused the separation of the Belgian and English forces and the French Army of the North from the main French Army and resulted in the encirclement and destruction of the northern units and the final crushing of France, was a German victory in the radio war of cryptography. Over one of the government-owned and -operated stations, spies or traitors concealed messages in code appraising the Germans of the thinly held line at the elbow between the Maginot and Little Maginot Line, and of the temporary gap between the armies moving rapidly into Belgium and the few divisions under General Corap holding the northern end of the Maginot Line. If this report is true, it shows that government-owned stations are as liable to subversive use as stations privately owned. It also proves that the Battle of France was lost in large part by radio.

This is doubly strange when one considers the fatalistic parallel this war has with World War No. 1. In World

War No. 1, the turning point was the Battle of the Marne. It was won by radio. In 1914, however, there was little radiotelephony, but much radiotelegraphy. The air was filled by radio traffic with many jammed wave lengths. French, British, Belgian, and German communications transformed the German offensive into a mess of faulty cooperation. On September 2, 1914, von Kluck was ordered to close up on von Bulow to his left and push the French away from Paris. He never received this message, but the French did. He radioed that he was following his original orders to swing southwest to Paris. This message was also intercepted by the French, but never received by the German GHQ. The French cryptographers laid the deciphered messages side by side before Joffre, and from them developed the Battle of the Marne, won by radio and cryptography.

However, ordinary military radio telephonic or telegraphic messages, their interception, and the cryptography relating to them, do not constitute, strictly speaking, a new problem. Although perhaps more complex now than it was before, and more exacting, particularly with respect to time, this is a fairly established military problem handled by the Signal Corps. According to the latest booklet on our armed forces, *The Army of the United States*, the Signal Corps is charged with intercepting enemy radio messages and locating enemy (military) radio stations by radio goniometry.

The new military problem which is the subject of this article is more in the province of the Military Intelligence Division (G-2) which has duties "that relate to collecting, studying, analyzing, and furnishing all kinds of military information," which "supervises any army activities dealing with military surveys, maps and photographs, codes and ciphers, and translations," and which "also directs a Press Relations branch which prepares and issues War Department press releases and handles other matters concerning relations with the press and with the public at large." To these extensive duties must be added the new military problem of radio propaganda and counter-propaganda, fifth column and counter-fifth column radio activities, and the audio-aspects as against the transmitter aspects of radio from the creation and production of radio entertainment to preventing fifth column or espionage secret communications by way of radio.

The problem does not always stop at any given line nor is it any too well-defined. Here, for instance, is an actual case: One of the most powerful short-wave stations in Europe, heard all over the world, often emitted either before or after a scheduled evening broadcast a buzzing signal resembling static, so fast in vibration it would not be recognized as consisting of separate noises. However, that was not the answer. The noise was actually a message concealed not only in code or cipher, but by speed of transmission, and intended for their nationals in a country six thousand miles away. First the message had been recorded, and then the record was broadcast as played at perhaps ten times the normal velocity. The key to its

reception and solution lay, of course, in reversing the operation.

Returning again to the four points of control which together represent the new military problem of radio, we can label them:

- (1) Espionage and fifth-column cryptography and censorship;
- (2) Propaganda and counter-propaganda;
- (3) Recreation, entertainment, and morale-building;
- (4) Neutralization of physical seizure of stations by enemy or fifth column.

These form a staggering new assignment for the Intelligence Division of our service. And on the basis of European experience, they offer as vital and as difficult a problem as any encountered in the warfare of 1940.

With regard to espionage and fifth-column cryptography and censorship, it will be well to explain and describe in detail how a message can be inserted in a commercial radio program broadcast. It should be clear that if by the adaptation of a well-known system a cryptogram can easily and secretly be transmitted through audio means and doubly concealed in the music, sound effects, and dramatic dialogue of the program, superior cryptographers would have no trouble doing a far better and more original job for espionage purposes or for the organization and control of a fifth column.

While many different methods can be used to conceal a cipher or code message in a radio program, including simple jargon, the most obvious cipher is the radio equivalent of the grille or "cardan" method, in which the sender writes his "clear" through the holes of the grille, the letters following the order of the numbered grilles, and then fills up the vacant spaces with innocent letters to make a message. In radio, actual words in most cases could be used as letters, and the grille replaced by key numbers, all based on the order of words in the program from its beginning, or from some key word. Here the difficulty of even suspecting, much less deciphering without both a recording and stenographic transcript of the broadcast, is to be noted. This is what makes sending and receiving cryptographic messages by radio easier than their discovery or prevention.

A reverse of the Gronsfeld cipher especially adapted for radio can also be effectively used. In the Gronsfeld, there is a set of key numbers in a series that can be easily memorized. These numbers are written down over the "clear" and repeated as often as necessary. Each letter of the "clear" is then represented in the written message by a letter which is the number of letters further in the alphabet called for by the key number over it. In the radio adaptation, a key word would be written down over the "clear" and repeated as often as necessary. Each letter of the "clear" can then be represented by a number equivalent to the number of letters in the alphabet separating the letter of the "clear" from the corresponding letter of the key word. In the radio program, words with the number of letters equivalent to those numbers could be designated at indicated spots or key breaks.

However, the most effective and practical cipher which would lend itself to radio is what might be called a radio adaptation of the Nihilist Bacon bilateral.

In this system, the key is a square as follows:

	2	3	4	5	6
2	A	B	C	D	E
3	F	G	H	I	J
4	L	M	N	O	P
5	Q	R	S	T	U
6	V	W	X	Y	Z

In writing the cipher, the numbers describing the position of a letter (its coordinates) are substituted for it. In the original, the numbers start with 1, but due to the fact that here also numbers of the message will be given by the number of letters in a word in the radio program, there are too few one-letter words to make the original key practicable. In writing text for the radio enciphered by the double-transposition system as explained above, it is necessary to assign them some definite words or order of words, the number of letters of which will indicate the message. For instance, if the second and fifth words after every musical theme, bridge, curtain, or sound effect (all of which are called "business" abbreviated BIZ—in radio work) has been agreed on, a sample written transcript of part of a program (involving an Oriental servant and a man as characters) follows:

PING: If patiently waiting, all things coming, thank you.  
BIZ: KNOCKS ON DOOR.

MAN: Well—Fancy that—Who is that?  
PING: No doubt knock on door meaning honorable self soon in bathtub, thank you.

MAN: I can't believe it. Open the door.  
BIZ: DOOR OPENS.

PING: Prediction is correct. Like humbly to present servant with humble liquid for bath.

MAN: Humble liquid for bath, eh? What is this humble liquid?

PING: Humble liquid very fine product of most noble cow.

BIZ: BUCKETS DEPOSITED ON FLOOR.

MAN: Cow? Is that stuff there milk? I'm supposed to take a bath in milk?

PING: Water very scarce. Milk very plentiful.

BOTH: Thank you.

MUSIC: FANFARE.

ANNOUNCER: The Foods Reel reels on!

The message would therefore be: 52—26—25, or by reference to the table, the "clear" would be: QED.

The most important fact in radio cryptography is the fact that while the sender and receiver need only worry about the key words, a recording and actual stenographic transcript of the program as it was actually broadcast must be obtained before a cryptogram can possibly be discovered or deciphered.

As for censorship, unfortunately, radio can sometimes do just as much harm in war for lack of efficient censorship as through enemy cryptography, in giving away military secrets or aiding fifth-column organization. In Europe, especially in Belgium and France, where listeners were so used to accepting news and announcements on government-controlled stations, lack of confidence and suggestion of catastrophe made thousands leave their homes and block the roads, thus to nullify military defense measures. Many broadcasts, no doubt by fifth columnists, urged the populations of whole cities to surrender or run. If anyone doubts American mass reaction to radio, one has but to remember the famous *War of the Worlds* broadcast which completely disrupted a quiet and peaceful New Jersey countryside. Perhaps H. G. Wells did not discover a secret weapon, but Orson Welles discovered that radio was certainly a weapon through which man's mind and imagination could be successfully attacked.

With regard to propaganda, it is a fact that there are definite propaganda short-wave programs already reaching America. In addition, there are definite programs and a considerable number of domestic broadcasts in foreign languages aimed at the large colonies of foreign-born.

In Europe, before and during the war, German propaganda by radio was as far ahead of the French and English as German superiority in military equipment of ground and air. Many times a week, at regularly scheduled times, outstanding symphonic concerts featuring French music or radio adaptations of French musical comedies and *l'Opéra Comique* were broadcast all over France by German stations. These programs built up a tremendous audience because of the superiority of their entertainment and production. They could be compared with certain commercial advertisers' programs in the United States, which through superior entertainment such as Charlie McCarthy and Jack Benny, attain such tremendous audiences that the networks have hard work selling any time competing directly against them. In other words, in radio propaganda, as in radio advertising, "the show's the thing." The size of the audience is directly in ratio to the entertainment and showmanship of the program.

After obtaining a large audience by superior entertainment, an advertiser in America takes care to see that his commercials sell his product and are as sugar-coated and innocuous as possible. In the more serious game of selling ideals and ideas, races, countries, and man, radio propaganda and counter-propaganda have become correspondingly adept.

In the German broadcast featuring French music and drama, occasionally a French speaker spoke to the French people explaining that Germany definitely did not want to go to war with France. That the social advantages in France were only a beginning, but that France was still in the grip of capitalists, and that the French people were forced to fight for England and her economic control of the world. This was all done in excellent taste, with superior production and accurate statistics, and featured na-

tive Frenchmen or Germans speaking perfect French. In England, the propaganda took a different tack, and from September to May millions of English and French soldiers listened to Lord Haw Haw and Paul Ferdonnet prove that they were fighting for nothing.

How efficient this invisible weapon can be is evidenced by "The Link," an English fifth column of English Fascists meeting regularly in London. It can be positively stated that this organization owes more to radio than to any other single factor. When Fascist Sir Oswald Mosley visited Paris as a member of the British fencing team at the world's championship a number of years ago, he was wine and dined by the radio executives of the government radio agencies of France, Italy, Belgium, Holland, Germany, and, strangely enough, Denmark, and also by the owners of several of the few commercial stations on the Continent.

The importance of the radio weapon is still paramount in the most militarily efficient country in the world. On June 27th, the German advance guard arrived at the Spanish-French border. The first German unit to reach the border consisted of twenty specialists of the radio-propaganda section travelling in radio-equipped trucks. They stated to correspondents that they broadcast many times a day both from their trucks and from radio stations taken over in their advance.

Yes, mastery of the sea may be vital to England, mastery of the air may win the present war for Germany, but mastery of the minds and hearts of men must be gained today to wage war successfully, and that mastery can only be attained in full by radio.

The actual recreation, entertainment, and morale-building qualities of radio are almost as important as the propaganda and counter-propaganda which are in most cases carried within the talks and shows broadcast. If radio is a "weapon" then we can carry the comparison further and call the entertainment the "propellant" by which it reaches the ears of millions, and propaganda the "disruptive" that either explodes theories and ideals, and leaves a horrible debris of apprehension and confusion, or crystallizes the understanding and gives men the urge to fight on.

The actual physical seizure of radio stations is our least important topic because it can only come at a stage in war at which radio will already have done its worst. Only upon invasion or revolution will the armed forces or the civil agencies of law and order be so helpless as to permit the seizure of radio stations by the enemy or by the fifth column. Yet plans should nevertheless be formulated to neutralize the effect of such a seizure in part of a nation just as plans are made for every other military eventuality.

In a visit to England just before the war, it was my very good fortune to discuss World War No. 2 with my friend, the late Sir Basil Thomson, who was head of Scotland Yard for eleven years and head of the British secret service in World War No. 1. His last remark to me was, "Remember that in the next war, radio will be the secret as well as the invisible weapon one always wonders about when a new war comes along." I now know he was right, and I hope that this article may at least serve to prevent its readers from underrating the problems created by this new weapon.

